

# An Innovative Human Area Networking Technology using Redtacton

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**Abstract**— All the user-friendly services require technologies that enable communication between people and objects in close proximity. This paper describes a model of human area networking technology that enables communication by touching, a technology we call Redtacton. Human area networking technology for communication between mobile terminals and between terminals that are embedded in the environment has become important. When cables are used for communication between terminals, the routing of the cables is clearly inconvenient. When very weak radio signals are used for the communication, data speeds are reduced by packet collision and other such problems in crowded places such as exhibition sites and security risk from unwanted signal interception is another problem. Technology for solving such problems includes the use of the person body as a signal path for communication. A transmission path is formed automatically when a person comes into contact with a device and communication between mobile terminals begins. Here, the human body acts as a transmission medium supporting IEEE 802.3 half duplex communication at 10Mbit/s.

**Key words:** Redtacton, Human Area Networking, Communication through Touch Technology

## I. INTRODUCTION

Redtacton technology is a Human Area Networking (HAN) which was introduced by Nippon telegraph and Telephone Corporation (NTT's) that uses the human body surface as a high speed and safe network transmission path. Human area network is a technology used for communication between mobile terminals and between the terminals that are embedded in the environment has become most important. When cables are used for communication between terminals, the clarity of the cables is clearly inconvenient. So, technology for solving such problems includes the use of the person's body as a signal path for communication [9]. A transmission path is formed automatically when a person comes into contact with a device and communication between mobile terminals begins. RED - It is an auspicious color according to Japanese culture for warmth/TACTON-meaning "action triggered by touching". In the past, Bluetooth, infrared communications (IrDA), radio frequency ID systems (RFID), and other technologies have been proposed to solve the "last meter" connectivity problem. But, they each had a various fundamental technical limitations that constrain its usage, such that precipitous fall-off in transmission speeds in multiuser environments producing network congestion [7]. The concept of intra-body communication was first proposed by IBM in 1996. This communication mechanism was later evaluated and reported by several research groups around the world. Finally, all limitations were overcome by NTT (Nippon Telegraph and Telephone Corporation) located in Tokyo, Japan by using

photonic electric field sensors and finally came up with a human area networking technology called "Redtacton".

## II. RED-TACTON MECHANISM

- Redtacton transmitter induces a weak electric field on the human body surface.
- The Redtacton depends on the proposition of the optical properties of an electro optic crystal which varies according to the changes in the weak electric field.
- Redtacton detects the changes in the optical properties of an electro-optic crystal using a laser and converts the result into an electrical signal in a detector circuit.

### A. Photonic Electric Field Sensor

$$E_a - E_b - E_c = E_s$$

- $E_a \rightarrow$  Electric field induced by the transmitter
- $E_b \rightarrow$  Electric field returning to the ground of the transmitter
- $E_c \rightarrow$  Electric field at the receiver
- $E_s \rightarrow$  Detected electric field at the receiver

## III. HUMAN AREA NETWORK

NTT has had excellent success with an electro-optic sensor combining an electro-optic crystal with laser light and recently reported an application of this sensor for measuring high frequency electronic devices. The electro-optic sensor has three key features [1]:

- It can measure electric fields from a device under test (DUT) without contacting it, which minimizes measurement disturbance,
- Ultra-wide band measurement is possible, and
- It supports one point contact measurement that is independent of the ground, which is the most significant feature in the present context.

NTT utilized this third feature to fabricate an intra-body communication receiver for its human area networking technology, which is called Redtacton [4].

## IV. WORKING OF REDTACTON

Similar to other technologies, Redtacton Technology, will have a transmitter and a receiver. As soon as the human body comes in contact with the Redtacton transceiver, the signals will start to be transmitted. When the contact is been taken off, the transmissions will be stopped. The terminals are either embedded in the devices or carried by the user itself [2]. According to the natural and physical movements of the user, the communication will happen in various combinations. The communication through the user can occur only through his body surface parts like hands, fingers, arms, feet, face, legs or torso. The technology also works in shoes and other clothing's as well.

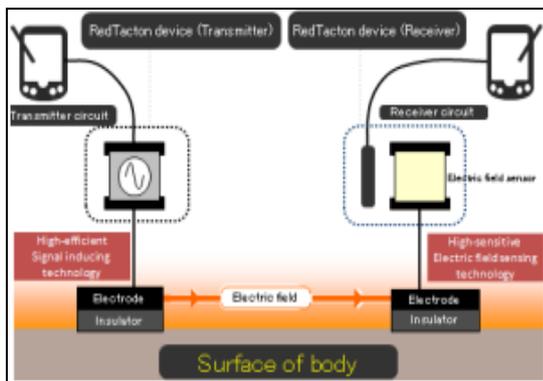


Fig. 1: Redtacton

### V. REDTACTON TRANSCIEVER

Transmitter consist transmitter circuit that has electric fields towards the body and a data sense circuit, which distinguishes transmitting and receiving modes by detecting both transmission and reception data and outputs control signals corresponding to the two modes to enable two way communication [3,8]. Implementation of receive-first half-duplex communication scheme that sends only after checking to make sure that there is no data to receive in order to avoid packet collisions. Redtacton takes advantage of the long-overlooked electric field that surrounds the human body.

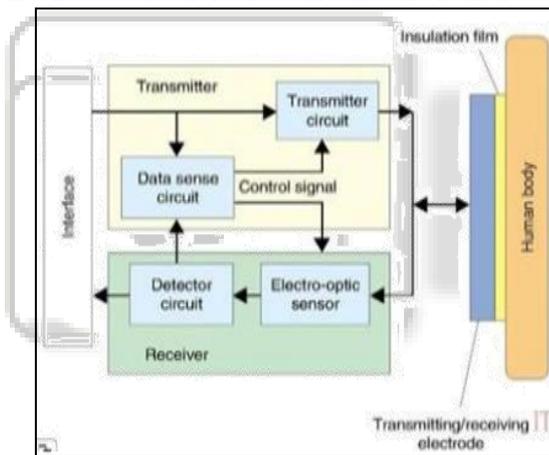


Fig. 2: Redtacton transceiver

Redtacton transceivers are completely covered within saluting film, so the body of the person acting as the transmission Medium is completely insulated. This makes it impossible for current to flow into a person's body from the transceiver.

### VI. MECHANISM OF COMMUNICATION WITH REDTACTON

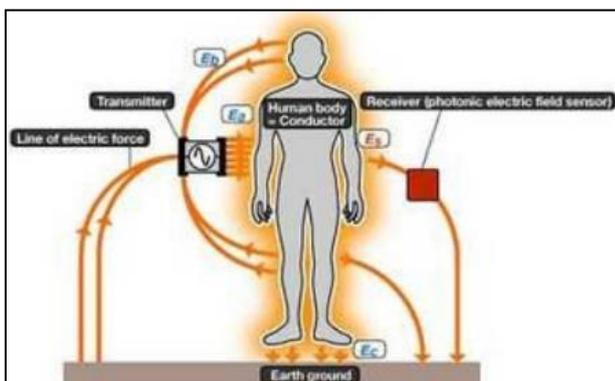


Fig. 3: Communication with Redtacton

The naturally occurring electric field induced on the surface of the human body dissipates into the earth as shown. Therefore, this electric field is exceptionally faint and not stable. The photonic electric field sensor developed by NTT enables weak electric fields to be measured by detecting changes in the optical properties of an electro-optic crystal with a laser beam [2, 6].

#### A. Advantages

- Redtacton does not require the electrode in direct contact with the skin
- High-speed communication is possible between two arbitrary points on the body
- Body-based networking is more secure than broadcast systems, such as Bluetooth which have high range of about 10m
- Network congestion due to fall in transmission speed in multiuser environments is avoided
- Superior than Infrared technology
- Superior than Wi-Fi

#### B. Disadvantages

- It has no compelling applications that aren't already available
- Too costly

### VII. APPLICATIONS

Basically, there are many applications based on Redtacton in different fields. It will be widely use in daily working schedule and they are as follows [8]:

#### A. One-to-One Services

Attribute information recorded in the Redtacton device is sent to the touched objects. The appropriate service is provided based on the attribute information received by the Redtacton receiver.

#### B. Marketing Applications

When a consumer stands in front of an advertising panel, advertising and information matching his or her attributes is automatically displayed. By touching or standing in front of items they are interested in, consumers can get more in-depth information. Inside a shop, shoppers can view related information on their mobile terminals immediately after touching a product.

#### C. Intuitive Operations

Print out where you want just by touching the desired printer with one hand and a PC or digital camera with the other hand to make the link. Complicated configurations are reduced by downloading device drivers "at first touch". Transfer songs to portable music players from notebook to PCs with just a touch.

#### D. Data Exchange

Communication can be kept private using authentication and encryption technologies. Group photos taken with digital cameras are instantly transferred to individual's mobile terminal. Diagrams written on white boards during meetings are transferred to individual's mobile terminals on the spot.

### E. Security Application

Redtacton could be installed on doors, cabinets and other locations calling for secure access, such that each secure access could be initiated and authenticated with a simple touch. At the same time, all the transaction details and relevant user attributes (personal identity, security clearance, etc.) could be logged by the security system. An Alarm sounds automatically to avoid accidental medicine ingestion. Touch advertising and receive information.

## VIII. CONCLUSION

Redtacton is an exciting new technology for human area networking. We have developed a transceiver that uses a human body as a data transmission medium based on electric field sensor that uses an electro-optic crystal and laser light. Using this transceiver, we succeeded in achieving 10BASE communication in accordance with IEEE 802.3 through a human body from one hand to other hand. While our main objective is to implement a Redtacton system supporting two-way intra body communication at a rate of 10Mbit/s between any two points on the body, our longer term plans include developing a mass market transceiver interface supporting PDA's and notebook computers while continuing efforts to reduce the size and power consumption of the transceiver to enhance its portability. NTT is committed to using its comprehensive commercialization functions to push this research out to the market place as quickly as possible while moving ahead with tests and trials in collaboration with commercial partners as necessary.

### A. Future Development

Data will travel through the user's clothing, handbag or shoes, anyone carrying a special card can unlock the door simply by touching the knob or standing on a particular spot without taking the card out. It will have many future applications such as walk through ticket gate, a cabinet that opens only to authorized people and a television control that automatically on or off.

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